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Memorial Hermann Hospital's resources of specialty physicians and highly acclaimed Level I trauma center is able to offer comprehensive consultative services to its extensive rural hospital affiliates. Telemedicine may serve as a solution to increase access to medical care and to capitalize on centralized computer informatics.

Acute stroke treatment is well suited for telemedicine consultation given the narrow therapeutic time window. Data suggests that rural patients' travel time to the tertiary center often exceeds the period needed for treatment. Emergency department assessments can be standardized with web-based computer informatics.

Use of videotaped measures of the subacute stroke survivor for consultative advice by a telemedicine interdisciplinary stroke rehabilitation service can lead to sophisticated treatment plans in a rural hospital in-patient setting.

Brain preservation and restoration of myocardial function are dual goals in resuscitation. The University of Texas Stroke Team has been involved with cardiac arrest and hypothermia for several years. Telemedicine may be well suited for guiding hypothermia treatment in cardiac arrest.

We can measure outcomes for complications rates, functional scales, patient, caregiver, and physician satisfaction. Results will be submitted to peer reviewed journals

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INTRODUCTION

Memorial Hermann Hospital Rural Texas Telemedicine Outcomes

Principal Investigators: Steve Allen, MD and John Choi, MD

Goals

We are establishing a telemedicine network with applications for specialty care to our affiliate hospitals that will improve outcomes, keep these facilities operational, and be self-sufficient. Key diseases to address by telemedicine include coronary artery disease, the leading cause of death in the U.S. and stroke, the leading cause of disability in the U.S. and the third leading cause of death. Defining the medical conditions that are well served by telemedicine evaluations is a specific mission of this project.

The Memorial Hermann Health Care System (MHHS) is committed to assisting rural communities in preserving local access to healthcare via solutions such as telemedicine. MHHS currently serves sixteen rural community hospitals and two urban facilities through its affiliated health care network. More than 51 million Americans live in rural areas, making up about 20 percent of the U.S. population. (Moskowitz 1999) Specialty care should be more available for the rural population, particularly for emergent and urgent management. Teaching and communicating such medical knowledge to rural health care providers is key for good outcomes and retention of quality providers in these communities.

Institutional Background

Memorial Hermann Hospital (MHH) has a legacy of providing top caliber care to the Houston and southeast Texas area. Management of complex medical emergency conditions with multiple components of health care has been a strength of MHH as illustrated with its level I trauma center. MHH medical staff have been international leaders in the field of cardiology and stroke for the past decade. MHH has the resources of a 24-hour on-call stroke team, interventional radiologists, stroke fellowship trained neurologists, neurosonologists, neurosurgeons, cardiology fellows, and interventional cardiologists. Studies have shown resources of teaching hospitals improve mortality in a variety of medical conditions. (Zimmerman JE SS 1993; McClellan M MB 1994; Rosenthal GE HD 1997; Chen J RM 1999; Taylor DH WD 1999)

University of Texas Health Science Health Center at Houston Stroke Service under the leadership of Dr. James Grotta has an international reputation for stroke and brain resuscitation excellence. Extensive work to standardize stroke has been done such as the Houston Prehospital and Emergency Care Stroke Treatment and Outcomes Study (HoPSTO). (Wojner AW 2003) The TLL Temple project lead by the stroke team improved delivery of acute stroke care intervening on 5 rural east Texas hospitals. (Morgenstern LB 2002) Brain preservation and restoration of myocardial function are dual goals in resuscitation. The University of Texas Stroke Team has been involved with cardiac arrest and hypothermia for several years and is a leader for this treatment. (Felberg, Krieger et al. 2001)

CURRENT TELEMEDICINE PROJECTS

BODY

There has been no research done on this project as of October, 2004. The investigators are awaiting official IRB decision on protocols submitted to TATRC/DOD 1 year and 1 month ago.

1. The Memorial Hermann Hospital Rural Texas Telemedicine Acute Stroke Outcomes

Hypotheses:

- 1) The use of telemedicine will promote use of IV t-PA therapy in ischemic stroke subjects at a rate greater than the known historical administration rate of 1% of all ischemic stroke subjects in rural areas. Benchmark goal is 8% or greater of all ischemic stroke subjects.
- 2) The mean National Institute of Health stroke scale (NIHSS) at 24 hours will improve by 4 points compared to enrolled subject's baseline with t-PA therapy. Median scores will also be compared.
- 3) The complication rate for clinically symptomatic intracerebral hemorrhage with IV t-PA within 48 hours of administration will be 6% or less consistent with national benchmark standards.

Background and Significance

Stroke or cerebrovascular disease requires emergent and urgent care. The military experience (Howard 1962; Burkle FM NC 1994; Kennedy K AR 1996; Swan 1996) and trauma medical center experience (West JG TD 1979; Clemmer TP OJ 1985) has demonstrated the benefits of early triage and specialized management. Stroke is the leading cause of disability in the United States at a cost of \$40.9 billion (American Heart Association 1997) and third leading cause of death. Stroke is a common term for a cerebrovascular accident resulting from sudden loss of blood flow to the brain or bleeding inside the brain.

Research Design and Methods

This is a descriptive single center study with multiple remote hospital sites designed to evaluate the satisfaction of health care providers and impact on management decisions by a telemedicine stroke consultation. We will enroll subjects treated with IV t-PA and follow their clinical course. We will be looking at 24 hour post NIHSS improvement which strongly links with disability (Adams, Davis et al. 1999; Frankel, Morgenstern et al. 2000; Weimar, Ziegler et al. 2002) and is valid. (Goldstein, Bertels et al. 1989; Albanese, Clarke et al. 1994; Kasner, Chalela et al. 1999) Data is transmitted securely through a *fiberoptic cable network* and T1 lines.

Conclusion

We are continuing our reputation as a leader in delivery of acute stroke care. We have devised a descriptive study based on our previous experiences that will allow us to make conclusions about the delivery of acute stroke care by telemedicine.

II. MEMORIAL HERMANN HOSPITAL STROKE REHABILITATION RURAL TEXAS TELEMEDICINE OUTCOMES.

Background and Significance

There are multiple challenges today confronting comprehensive and well-coordinated stroke rehabilitation. Among these challenges are: 1) significant variation in the delivery of stroke rehabilitation; 2) pressures from third party payers to reduce inpatient rehabilitation lengths of stay, and 3) geographical distance from specialized stroke care following discharge from a specialized stroke inpatient unit. These factors require alternative and innovative post-acute treatment modalities to enhance stroke rehabilitation. In rural communities, the complete specialized services and supports needed by patients after stroke are not available.

Hypotheses:

1) Telemedicine interdisciplinary stroke services using videotaped measures can reduce the risk of post stroke complications (infections, deep venous thrombosis, painful shoulders/knees, contracture, malnutrition, pressure sores, recurrent stroke, rehospitalizations) of stroke victims as the primary outcomes and improve post-stroke depression, reduce mortality, reduce length of stay, increase functional outcomes, and caregiver psychological burden 2) Telemedicine directed real time swallow assessment via fiberoptic endoscope is an effective evaluation.

Given the complex needs of stroke victims, interdisciplinary and multidisciplinary teams of stroke teams have the evidence-based support in reducing complications and improving functional outcomes. (Dennis 1994; Kalra L 1995; Kaste M 1995; Webb DJ 1995; Indredavik B 1997; Stroke Unit Trialists' Collaboration 1997; Ronning OM 1998; Ronning OM 1998; Fagerberg B 2000) Prevention of aspiration pneumonia and maximizing nutrition is a main priority. Videofluoroscopy (modified barium swallow) or fiberoptic endoscopic examination of swallowing (FEES) can give a more sensitive evaluation (ECRI 1999; Martino R 2000; Lim SHB 2001; Perry L 2001) but are not readily available in most rural hospitals including speech therapy services.

Research Design and Methods

At the remote hospital, we will ask the therapist to provide videotaped measures of the patient. A speech therapist can do a more detailed remote real-time, interactive, videofluoroscopy examination or observe/assist during a flexible fiberoptic endoscopic evaluation (FEES) to better assess swallowing. This collection of patient videotaped measures will be presented in a weekly videoteleconferencing (VTC) between the staff of the community/rural hospital (therapists, nursing staff, physicians) and the stroke specialist team at Memorial Hermann Hospital (neurologist, physiatrist, therapist). Outcome will be measured by a number of validated scales.

Conclusion

Telemedicine use in a stroke interdisciplinary team is a novel concept that has not been evaluated. Studies show strong evidence of good effect with stroke interdisciplinary teams and stroke units.

III. TELEMEDICINE MANAGEMENT OF HYPOTHERMIA THERAPY IN CARDIAC ARREST AND AUTOMATED EXTERNAL DEFIBRILLATOR INITIATIVE FOR UNDERSERVED AREAS IN TEXAS

Introduction

Telemedicine-facilitated use of automated external defibrillators (AEDs) and telemedicine directed hypothermia therapy would serve as an effective delivery care system for emergent cardiac disease management in underserved areas. Hypothermia treatment in cardiac arrest is a new standard of care practice with the backing of the American Heart Association (Nolan, Morley et al. 2003) but is difficult to implement in rural areas.

Hypotheses:

1) Educational efforts using telemedicine can facilitate hypothermia treatment and distance learning for AEDs by first responders. 2) Telemedicine promotes hypothermia treatment in selected out-of-hospital cardiac arrest primarily rural-based subjects. 3) Hypothermia goals include reaching 33-34°C within four hours of the start of cooling, and maintaining hypothermia for 12 to 24 hours from the start of cooling. 3) Look at recovery with several clinical scales.

Background and Significance

Sudden cardiac death affects 400,000 lives in the United States each year. Much of the progress in cardiology has focused on emergent treatments that reperfuse ischemic myocardial tissue and improve cardiac output. The cessation of blood flow has clear devastating effects to the brain without immediate treatment. The positive effects of hypothermia in two recent trials (2002; Bernard, Gray et al. 2002) demonstrates that rapid efficacious treatment against global brain ischemia for cardiac arrest victims is a reality.

Cardiac arrest may benefit from telemedicine because the videoteleconferencing may help provide an efficient means to overcome reluctance by first responders to use AED's. The ability to visualize the patient, first responders, primary health care providers, and medical data such as EKGs can be the difference between success and failure in brain and cardiac resuscitation, where minutes count. Vital signs and telemetry reading is more accessible via telemedicine. This contact can also help aid in transfers to a higher level of care. Interventional cardiology services of angioplasty and stenting are not as routinely available in rural regions of Texas versus urban areas. The greatest advantages of telemedicine is the ability to provide immediate feedback from visual-audio information as well as provide interactive training in an efficient manner to multiple remote sites.

Research Design and Methods

This study evaluates the value of the telemedicine intervention in promoting hypothermia treatment in a hospital quasi-experimental design. We will provide protocols that each of the rural facilities can adopt for use. We will also use distance learning and interactive teaching via telemedicine at these hospitals for classes to the first responders about AED use.

Conclusion

Telemedicine will be shown to increase the quality and access to healthcare for rural patients. Rural nurses and other professional staff will benefit from the professional relationships resulting in better patient care and maintaining a quality healthcare provider base. Cardiac arrest also includes brain resuscitation as a priority measure.

Summation:

Because the target sites are rural areas with health professional shortages, most consultations will be reimbursable under HCFA rural telehealth reimbursement regulations. Education regarding billing and collection services will be an integral part of the training program for physicians. Rural affiliate hospitals after initial equipment investment will in subsequent years be expected to allocate funds for a percentage of operation costs to maintain the network. Memorial Hermann Health Care System is committed to sustaining this initiative with successful outcomes. This project will involve the equipment, protocols, outcomes, and extensive training necessary to ensure its success for the future.

BIBLIOGRAPHY (available on request)

KEY RESEARCH ACCOMPLISHMENTS

Our senior research nurse has been hired on April 12, 2004 and based on her position has 80% of salary covered from this DOD funding of the "Memorial Hermann Telemedicine Outcomes Project."

She has been involved in the following activities while awaiting US Army IRB approval of the telemedicine protocols before starting direct human subject research:

- She has taken the required NIH approved ethics course on conducting human subject research and certified in the NIH stroke scale.
- She has interacted with the University of Texas IRB regarding protocol submission and working with our rural telemedicine sites to have institutional compliance with federal regulations regarding human subject research. She has spent significant time regarding obtaining Federal Wide Assurance numbers for each site.
- She has interacted regularly with the US Army MRMC regarding rules and regulations for research protocol compliance.
- She has been working with some of the personnel at the emergency departments of our remote sites regarding questions about our telemedicine protocols and identifying local principal investigators for each site.
- She has learned the specific operations of the telemedicine equipment to be used. She has spent some time visiting the Phonoscope Headquarters, the telemedicine vendor to get some of this in-servicing.
- She has visited the sites for information regarding the telemedicine protocols as listed: Angleton-Dansbury Medical Center, Angleton, TX, April 14, 2004; the Memorial Hermann Baptist Beaumont Hospital Emergency Department, Beaumont, TX April 29, 2004; Yoakum Community Hospital, Yoakum, TX, May 12, 2004; Memorial Medical Center, Port Lavaca, TX, May 27, 2004; Colorado Fayette Medical Center, Weimar, TX, June 10, 2004; Yoakum Community Hospital, Yoakum, TX, June 14, 2004; El Campo Memorial Hospital, El Campo, TX, June 30, 2004

REPORTABLE OUTCOMES

There have been no outcomes resulting from this project. Official review of the IRB at TATRC/DOD is pending.

CONCLUSIONS

There is no completed research on this project at this time.

REFERENCES

None

APPENDICES

None